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ABSTRACT

This course of study provides the framework for the content of a program in industrial arts/technology education. An introduction describes industrial arts/technology education, lists goals, and presents suggestions for meeting the needs of special populations. A conceptual framework is provided that organizes required minimum content for the program into five core courses at the junior high or middle school levels (exploring technology; construction cluster; communications cluster; manufacturing cluster; power, energy, and transportation cluster) and nine core courses at the high school level (graphic arts; technical drawing; engineering graphics; construction industry; power mechanics; power and energy; electronics technology; metal technology; and wood technology). A diagram summarizing the conceptual framework follows this section. The next section provides outcomes for the core courses along with corresponding topics. Brief descriptions of two optional courses are then given. The course of study concludes with information on vocational student organizations and benefits of student participation in them. (YLB)

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Alabama Course of Study
Industrial Arts/ Technology Education

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Alabama Course of Study
INDUSTRIAL ARTS/ TECHNOLOGY EDUCATION

Wayne Teague
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ALABAMA STATE DEPARTMENT OF EDUCATION
MONTGOMERY, ALABAMA 36130
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ALABAMA COURSE OF STUDY
INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

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PREFACE

Federal legislation mandates that vocational education programs provide a coherent sequence of courses that include exploration of careers, understanding of basic family concepts, and preparation for employment.

Alabama Law, Act No. 84-234 in section 16-35-4 states:

> The state board of education, on the recommendations of the state superintendent, shall prescribe the minimum content of courses of study for all public, elementary and high schools in the state....

This course of study provides the framework for the content of a course and/or program in vocational education. The primary purpose of the course of study is to assist administrators and teachers in developing and maintaining high quality vocational programs that produce employable students with entry-level job competencies and students with basic family living skills. A secondary purpose is to add uniformity to vocational programs.

The core courses in this document contain student outcomes that meet the five characteristics of any course of study: basic, appropriate, reachable, reasonable, and enforceable. The outcomes dictate the content that is to be used in planning effective and comprehensive vocational programs.

The course of study is a foundation for each vocational education program. Local school systems are encouraged to add content to accommodate varying local patterns of organization, resources, and needs.

INTRODUCTION

In either a primitive or an advanced society, understanding of the technology of that culture is basic to survival. Technology is the total of what human beings know about and do with materials. It is society expressing itself with materials, tools, machines, and energies. Technology is society's changing ways of thinking, doing, and living as well as changing values, standards, and concerns.

One of the primary functions of its schools, then, is to acquaint the young with the nature of the technological culture. In so doing, the curricular offerings must provide students the opportunity to interact with the technology itself. Students must be able to understand, to use wisely, to control, and to change that which technology creates. Industrial Arts/Technology Education offers assistance to students by serving as the interpreter of technology in the school. The school, with its vast societal responsibilities and enormous task of educating the young, must keep pace with the changes caused by technological advances. These advances accentuate the necessity for Alabama students to participate in a comprehensive, contemporary, technologically oriented educational program that will enable them to make appropriate educational and occupational decisions. Knowledge and understanding of technology are needed for appropriate action as a citizen.

Industrial Arts/Technology Education is a discipline of education for everyone. It draws from technological subject matter developed to promote understanding of technology; origins and development of industrial education; and the individual's relationship to the environment through the use of unique curriculum, facilities, and methodology. Industrial Arts/Technology Education provides an opportunity for students to explore occupations and to gain an understanding of our industrial/technical society, especially in the areas of manufacturing, construction, communications, and power/energy/transportation. Each of these areas represents a system of adaptive human behavior and technical endeavors that exist to extend human potential through technology.

GOALS OF INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

1. Provide students with a broad understanding of and appreciation for the tools, materials, energies, ideas, and processes used in producing material goods and providing industrial-related services.

2. Enable students to discover; to develop aptitudes to apply creatively their individual talents, interests, attitudes, and abilities that relate to industry and technology; and to make appropriate decisions about their future education and occupational preparations.

3. Provide students with an understanding of the roles, purposes, and functions of industry and technology in the free enterprise system and the impact of these on the individual, society, the economy, and the environment.

4. Provide students with opportunities to develop and utilize social and leadership skills, to acquire responsible attitudes about safe and efficient work practices, to have an understanding of and appreciation for craftsmanship and the dignity of work, and to solve problems involved in the application of basic skills.

5. Provide students with the opportunity to apply the content of other school subjects to that of Industrial Arts/Technology Education.

Meeting the Needs of Special Populations

Courses, instructional strategies, and equipment may be modified to ensure that special populations have equal access to the full range of learning experiences and skill development in Industrial Arts/Technology Education. Individual needs of students must be determined by assessments of their interests, abilities, and special needs. Once individual needs have been determined, a support service program, planned cooperatively with the vocational teacher and support personnel, may be initiated.

A separate program or course may be developed if special needs' students cannot develop competencies needed for Industrial Arts/Technology Education in the mainstream environment even with support services. Separate programs must be of the same quality and scope as programs provided for non-handicapped and non-disadvantaged students. Special strategies that may be used in separate programs include instruction and support services designed to help students overcome barriers created by their specific needs or situations.

CONCEPTUAL FRAMEWORK FOR INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

Core courses* at the junior high or middle school levels focus on exploring technology and the four broad clusters of technology: manufacturing, construction, communications, and power/energy/transportation. These courses, which are offered from nine to eighteen weeks, introduce students to a variety of instructional experiences on a rotational basis. The illustration on page six shows a logical arrangement of courses that should be taught at various grade levels in order to achieve the desirable articulation. Each of the courses shown is described in greater detail in other sections of this course of study.

Core courses at the high school level are more specific than exploratory core courses and are designed to provide an enriched background for advanced vocational, technical, or professional studies. These courses are primarily recommended for Grades 9 and 10; however, students at Grades 11 and 12 who have not previously been enrolled may take them, depending upon the students' educational and occupational objectives. Selected semester courses may be paired for a year-long course.

Optional courses** are Telecommunications Technology and Research and Development. The Research and Development course may be coupled with any of the semester high school courses to

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*Core Courses are essential to the program.
**Optional Courses are important to the program.

provide advanced experiences for an additional semester. If any local school system wishes to initiate a futuristic program, it may pilot (three years) this program provided the following criteria are met:

1. Sufficient student demand is present.
2. Curriculum is developed in advance.
3. Approval is obtained from the Alabama State Department of Education.

A natural flow should occur between Industrial Arts/Technology Education courses at the exploratory and pretechnical course levels and the Trade and Industrial Education Program at the upper secondary and postsecondary levels. Industrial Arts/Technology Education courses introduce students to a broad range of occupations and skills, whereas the Trade and Industrial Education Program narrows the options and provides in-depth skill development to the point of acquiring job-entry level skills.

ALABAMA INDUSTRIAL ARTS / TECHNOLOGY EDUCATION

EXPLORATORY CORE COURSES FOR THE MIDDLE GRADES

* 9 WEEKS IN LENGTH (MAY BE EXTENDED TO 18 WEEKS)

* EXPLORING TECHNOLOGY
* CONSTRUCTION CLUSTER
* COMMUNICATIONS CLUSTER
* MANUFACTURING CLUSTER
* POWER / ENERGY / TRANSPORTATION CLUSTER

TRADE AND INDUSTRIAL EDUCATION PROGRAMS

(GRADES 10-12)

CORE COURSES FOR GRADES 9-10

18 or 36 WEEKS

TECHNICAL DRAWING*
ENGINEERING GRAPHICS
CONSTRUCTION INDUSTRY
ELECTRONICS TECHNOLOGY
GRAPHIC ARTS
METAL TECHNOLOGY
WOOD TECHNOLOGY

18 WEEKS

POWER MECHANICS
POWER AND ENERGY

*PREREQUISITE FOR ENGINEERING GRAPHICS

OPTIONAL COURSES

RESEARCH AND DEVELOPMENT
TELECOMMUNICATIONS TECHNOLOGY

JOB ENTRY

VOCATIONAL/ TECHNICAL SCHOOLS

OR

JUNIOR COLLEGES/ UNIVERSITIES

STATEMENT OF DELIMITATIONS

This course of study is a document limited to minimum requirements and job component core courses. Requirements are expressed in terms of student outcomes. The competency-based outcomes are minimum. They may be expanded at the school or system level to meet the community needs and business and industry requirements.

The course of study is not intended to be used as a curriculum guide and does not include learning activities. Curriculum guides that include activities, teaching methods, resources, and student evaluations may be developed at the state, system, and/or school level.

While attempts were made to review current literature and research pertaining to curriculum development nationwide, student outcomes will need to be updated as new occupations and technologies emerge.

This course of study is designed to give teachers the flexibility to rearrange outcomes to meet student instructional needs. While some optional courses are indicated in the graphic section of the conceptual framework, only a brief description of each optional course is provided. Student outcomes for these optional courses are not included.

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

EXPLORING TECHNOLOGY

This course is exploratory in nature and introduces students to technology and the entire series of courses that follow it in this course of study. Students participate in stimulating activities selected from each of the four major clusters of technology that Industrial Arts/Technology Education addresses: construction, manufacturing, communications, and power/energy/transportation. Each activity is of short duration for initial exploratory experiences.

TOPICS	STUDENT OUTCOMES
	Students will
TECHNOLOGY	1. Explain and use the concepts and/or terminology related to Industrial Arts/Technology Education. - Oral - Written
	2. Develop an understanding of the relationship of science, language arts, mathematics, computer literacy, and social studies to technology.
	3. Demonstrate an understanding of technology through the use of basic tools, materials, and processes.
SAFETY	4. Adhere to industrial safety standards.
	5. Demonstrate safe housekeeping practices at the work station and within the total laboratory.
	6. Exercise care and respect through the use of safety rules for tools, equipment, and materials.
	7. Apply laboratory safety rules and procedures.

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

EXPLORING TECHNOLOGY

TOPICS	STUDENT OUTCOMES
	Students will
SAFETY (continued)	8. Explain precautions and practices associated with prevention and extinguishing.
	9. Explain precautions and practices associated with the treatment and disposal of hazardous materials and waste.
ACADEMIC SKILLS	10. Apply basic English skills while completing selected written and oral technological assignments.
	11. Apply basic mathematical skills while completing selected technological assignments.
	12. Apply basic science principles, theories, laws, and procedures while completing selected technological assignments.
COMPUTER LITERACY	13. Demonstrate basic computer literacy. - Terminology - Operation
	14. Discuss advantages and disadvantages of the use of computers in technology.
TECHNOLOGICAL INFLUENCES	15. Develop a recognition of technology and its effect on the individual, society, and the environment.
ECONOMIC FACTORS	16. Describe economic factors that impact on industry.
ENTREPRENEURSHIP	17. Describe the principles of entrepreneurship.
	18. Relate the importance of entrepreneurship to the economy of the United States.

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

EXPLORING TECHNOLOGY

TOPICS	STUDENT OUTCOMES
	Students will
ENTREPRENEURSHIP (continued)	19. Describe the business skills needed to operate a small business efficiently and effectively.
LEADERSHIP	20. Demonstrate cooperative and competitive skills in group situations. Examples: in Technology Student Association (TSA), in classroom organizations
	21. Adhere to basic parliamentary procedures. Examples: in TSA, in classroom organizations, in government
	22. Exhibit leadership and/or followership in group situations. - Purposes of TSA - Activities of TSA
CAREERS	23. Identify careers in Industrial Arts/Technology Education.
CLUSTERS CONSTRUCTION COMMUNICATION MANUFACTURING POWER, ENERGY, AND TRANSPORTATION	24. Identify the clusters of Industrial Arts/Technology Education, and describe occupations and activities associated with each.
	25. Apply the basic manipulative skills associated with each cluster.

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

CONSTRUCTION CLUSTER

The purpose of this course is for students to explore the kinds and levels of work performed in construction industries.

The course content includes, but is not limited to, the exploratory study of construction industries, technologies, land development, substructures, and superstructures. The course content is reinforced by laboratory activities and by the study of occupations, skills, safety, human relations, and leadership.

TOPICS	STUDENT OUTCOMES
	Students will
TECHNOLOGY	See pages 9-11, Outcomes 1-23.
HAND TOOLS	24. Classify hand tools according to their proper use. Examples: sawing, shaping, carving, drilling, boring, clamping
POWER TOOLS AND MACHINES	25. Demonstrate safety procedures in the use of power tools and machines. Examples: drill press, electric drill, band saw, lathe, shaper, sanding machines, router
DESIGNING AND ENGINEERING	26. Demonstrate an understanding of the design and engineering practices used in the construction industry. 27. Solve design problems using working drawings.
LAND DEVELOPMENT	28. Identify tools used in surveying. 29. Identify survey points for a topographic map. 30. Demonstrate a knowledge of reading topographic maps.

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

CONSTRUCTION CLUSTER

TOPICS	STUDENT OUTCOMES
	Students will
LAND DEVELOPMENT (continued)	31. Describe structure placement according to land use features.
	32. Explain effects of design requirements on site selection.
	33. Recognize procedures in site preparation for construction.
SUBSTRUCTURES	34. Determine soil strengths by testing.
	35. Explain the function of the substructure of a building.
	36. Interpret load bearings of surfaces.
	37. Identify parts of substructures. Examples: footings, foundation walls
	38. Identify tools and methods used in setting foundations.
	39. Construct simple forms used in concrete placing.
SUPERSTRUCTURES	40. Explain the function of the superstructure of a building.
	41. Identify major sections of a superstructure. Examples: floor sections, roof sections, wall sections
	42. Explain the process used in industry to install utilities in superstructures.

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

CONSTRUCTION CLUSTER

TOPICS	STUDENT OUTCOMES
	Students will
SUPERSTRUCTURES (continued)	43. Describe how heated and cooled air is transferred through a house.
	44. Identify and describe the operations of common electrical fixtures.
	45. Demonstrate simple wiring.
	46. Identify methods of enclosing a superstructure.
	47. Describe what is meant by completion of the project and completion of the site.
	48. Recognize the importance of servicing the property. - Utilities - Appliances
CAREERS	49. Identify careers in the field of construction.
	50. Express a knowledge of the construction industry organizations.
	51. Demonstrate effective employability skills. Examples: résumés, job interviews

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

COMMUNICATIONS CLUSTER

The purpose of this course is for students to explore the kinds and levels of work performed in communication industries.

The course content includes, but is not limited to, the exploratory study of communications industries, technical drawing, graphic arts, and electronics communications. The course content is reinforced by laboratory activities and by the study of occupations, skills, safety, human relations, and leadership.

TOPICS	STUDENT OUTCOMES
	Students will
TECHNOLOGY	See pages 9-11, Outcomes 1-23.
TECHNICAL DRAWING	24. Identify the basic equipment, techniques, and terminology used in technical drawing. - Drafting - Graphic Arts - Electronics Communications
	25. Produce drawings following standardized procedures. - Symbols and lettering - Measurement - Freehand sketching - Multiview drawing - Charts and graphs - Pictorial illustrations
	26. Identify a design problem and solve the problem using the design process.
GRAPHIC ARTS	27. Research and identify the style and types of printed products desired by consumers.

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

COMMUNICATIONS CLUSTER

TOPICS	STUDENT OUTCOMES
	Students will
GRAPHIC ARTS (continued)	28. Use proper layout and design skills for producing a printed product. - Offset/mimeograph - Relief printing - Screen process printing - Lithographic printing - Gravure
	29. Demonstrate the ability to use bindery skills.
	30. Demonstrate the ability to use the padding process. Example: note pad
	31. Identify the basic techniques, principles, and equipment used in the area of photography.
	32. Demonstrate the ability to produce a picture. Examples: pinhole camera, photogram, 35mm camera
	33. Discuss and/or demonstrate how film and prints are developed.
ELECTRONICS COMMUNICATIONS	34. Demonstrate the ability to produce audio recordings and broadcasts. Examples: newscast, sports event
	35. Demonstrate the ability to produce video recordings and motion pictures. - Story board - Directing - Producing

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

COMMUNICATIONS CLUSTER

TOPICS	STUDENT OUTCOMES
	Students will
FIBER OPTICS	36. Explain the principles of fiber optics.
CAREERS	37. Identify careers in the field of communications.
	38. Express a knowledge of the communications industry organizations.
	39. Demonstrate effective employability skills. Examples: résumés, job interviews

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

MANUFACTURING CLUSTER

The purpose of this course is for students to explore the kinds and levels of work performed in manufacturing industries.

The course content includes, but is not limited to, the exploratory study of manufacturing industries; technologies; the free enterprise system; and the work of planners, designers, engineers, and other occupations. The course content is reinforced by laboratory activities and by the study of skills, safety, human relations, and leadership.

TOPICS	STUDENT OUTCOMES
	Students will
TECHNOLOGY	See pages 9-11, Outcomes 1-23.
HAND TOOLS	24. Classify hand tools according to their proper use. Examples: sawing, shaping, carving, drilling, boring, clamping
POWER TOOLS AND MACHINES	25. Demonstrate safety procedures in the use of power tools and machines. Examples: drill press, electric drill, band saw, lathe, shaper, sanding machines, router
RESEARCH AND DEVELOPMENT	26. Explain the importance of research and development.
MANUFACTURING PLANNING	27. Explain the need for planning in manufacturing. Examples: personnel, materials
	28. Demonstrate the research and development processes used in manufacturing projects.

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

MANUFACTURING CLUSTER

TOPICS	STUDENT OUTCOMES
	Students will
PRODUCT SELECTION	29. Assess consumer demand. - Consumer survey
	30. Identify company abilities and limitations.
	31. Examine cost and profit figures.
PRODUCT DESIGN AND ENGINEERING	32. Demonstrate a knowledge of the processes of design. Examples: balance, harmony
	33. Implement decision-making techniques when selecting a design.
	34. Explain the engineering process.
	35. Demonstrate the ability to design and build a prototype.
	36. Test prototypes.
	37. Construct manufactured products.
ORGANIZATION OF A COMPANY	38. Examine the structure of a manufacturing company.
	39. Discuss types of ownership.
	40. Identify major operations of a manufacturing company.
PLANNING OF PRODUCTION	41. Differentiate among types of production.
	42. Determine production cost.
	43. Discuss production analysis.

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

MANUFACTURING CLUSTER

TOPICS	STUDENT OUTCOMES
	Students will
PLANNING OF PRODUCTION (continued)	44. Organize facility layout for effective and efficient production of a product.
PREPARATION FOR MANUFACTURING	45. Interpret contracts used for purchasing.
	46. Analyze material requisitions.
	47. Explain the tooling-up process, and illustrate how it changes in various situations.
PRODUCTION OF PRODUCTS	48. Identify the initial steps of production.
	49. Develop and use quality control skills.
	50. Demonstrate a trial run of the production process.
	51. Illustrate processes involved in the production run of a product.
	52. Design, develop, and test appropriate packaging for a product.
MARKETING OF PRODUCTS	53. Demonstrate advertising methods.
	54. Explain various sales methods.
	55. Interpret distribution methods.
	56. Differentiate profit and/or loss.
	57. Develop an awareness of the free enterprise system.
CAREERS	58. Identify careers in the field of manufacturing.

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

MANUFACTURING CLUSTER

TOPICS	STUDENT OUTCOMES
	Students will
CAREERS (continued)	59. Express a knowledge of manufacturing industry organizations.
	60. Demonstrate effective employability skills.
	Examples: résumés, job interviews

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

POWER, ENERGY, AND TRANSPORTATION CLUSTER

The purpose of this course is for students to explore the kinds and levels of work performed in power/energy/transportation industries.

The course content includes, but is not limited to, the exploratory study of power/energy/transportation industries and systems. The course content is reinforced by laboratory activities and by the study of skills, safety, human relations, and leadership.

TOPICS	STUDENT OUTCOMES
	Students will
TECHNOLOGY	See pages 9-11, Outcomes 1-23.
ENERGY	24. Discuss the sources of energy. - Exhaustible - Inexhaustible - Renewable
TRANSMISSION AND CONTROL OF POWER	25. Discuss the principles of machines.
MECHANICAL SYSTEMS	26. Use correct terminology while operating a simple mechanical power system. 27. Demonstrate a knowledge of control devices. - Gears - Pulleys - Clutches 28. Demonstrate the ability to construct a simple mechanical power system. 29. Identify techniques that are emerging in mechanical power. 30. Display knowledge of the operation and repair of a small gasoline engine.

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

POWER, ENERGY, AND TRANSPORTATION CLUSTER

TOPICS	STUDENT OUTCOMES
	Students will
FLUID SYSTEMS	31. Explain the principles and theory of fluid power. - Oral - Written
	32. Use correct terminology while operating a simple fluid power system.
	33. Demonstrate the ability to construct a simple fluid power system.
	34. Discuss techniques that are emerging in fluid power.
ELECTRICAL SYSTEMS	35. Use correct terminology while operating a simple electrical power system.
	36. Demonstrate a knowledge of electrical principles and theories. Examples: electron theory, magnetism, sources, control
	37. Demonstrate the ability to construct a simple electrical power system.
	38. Illustrate an understanding of simple wiring techniques. Examples: parallel, series
	39. Explain the principles of lasers.
	40. Identify basic principles of electric motor operations.

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

POWER, ENERGY, AND TRANSPORTATION CLUSTER

TOPICS	STUDENT OUTCOMES
	Students will
ELECTRICAL SYSTEMS (continued)	41. Display knowledge of the operation and repair of a simple electric motor.
ENVIRONMENTAL CONTROL SYSTEMS	42. Describe the environmental control systems.
	43. Describe domestic and commercial applications of environmental control systems.
TRANSPORTATION SYSTEMS APPLICATIONS	44. Analyze types and modes of transportation.
	45. Describe the components of a transportation system. - Inputs - Processes - Outputs
	46. Describe power and energy applications in transportation industries.
CAREERS	47. Identify careers in the fields of power, energy, and transportation.
	48. Express a knowledge of power, energy, and transportation industry organizations.
	49. Demonstrate effective employability skills. Examples: résumés, job interviews

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

GRAPHIC ARTS

The purpose of this course is to provide students with a foundation of knowledge and technically oriented experiences in the study of Graphic Arts.

The course content includes, but is not limited to, process photography methods and production processes, such as offset printing, screen process printing, and relief printing. The course content is reinforced by laboratory activities and by the study of entrepreneurship, careers, safety, and leadership skills. Research and development are infused in the course through searching, experimenting, discovering, and testing.

TOPICS	STUDENT OUTCOMES
	Students will
TECHNOLOGY	See pages 9-11, Outcomes 1-23.
MAJOR PRINTING PROCESSES	24. Explain the process of relief, gravure, screen, lithographic, electrostatic, and projection printing.
	25. Apply the different printing processes in the production of printed projects.
PRINTING MATERIALS	26. Describe the manufacturing technology and process in making paper and inks.
	27. Explain the materials used in the graphic arts industry. Examples: paper, ink, film
PREPARATION OF ART AND COPY	28. Explain the principles of graphic arts layout and design.
	29. Apply the standard procedures and techniques in generating copy or paste-ups for printing reproduction.
PHOTOGRAPHY	30. Identify different types of process cameras.

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

GRAPHIC ARTS

TOPICS	STUDENT OUTCOMES
	Students will
PHOTOGRAPHY (continued)	31. Apply the procedures for camera set-up, exposing, and film processing.
PLATEMAKING	32. Identify the procedures for producing a quality line and a half-tone negative.
	33. Identify the types, styles, and properties of offset lithographic plates.
SCREEN PROCESS PRINTING	34. Describe the types of inks and screens for screen process printing.
	35. Demonstrate the standard procedures for screen process printing.
FINISHING AND BINDING	36. Identify the parts of a case-bound book.
	37. Demonstrate the standard procedures for finishing and binding. Examples: hot stamping, laminating, perforating, punching, drilling
CAREERS	38. Identify careers in the fields of graphic arts.
	39. Express a knowledge of the graphic arts industry organizations.
	40. Demonstrate effective employability skills. Examples: résumés, job interviews

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

TECHNICAL DRAWING*

The purpose of this course is to provide students with a foundation of knowledge and technically oriented experiences in the study of Technical Drawing.

The course content includes, but is not limited to, the study of drafting equipment, techniques, and lettering. The course content is reinforced by laboratory activities and by the study of entrepreneurship, careers, safety, and leadership. Research and development are infused in the course through searching, experimenting, discovering, and testing.

*TECHNICAL DRAWING is a prerequisite to ENGINEERING GRAPHICS.

TOPICS	STUDENT OUTCOMES
	Students will
TECHNOLOGY	See pages 9-11, Outcomes 1-23.
DRAFTING EQUIPMENT	24. Demonstrate proper use of drafting instruments.
STANDARD DRAFTING SKILLS	25. Demonstrate standard drafting skills procedures. - Symbols and alphabet of lines - Lettering - Measuring - Freehand sketching - Geometric constructions
	26. Interpret information from drawings, prints, and sketches.
ORTHOGRAPHIC PROJECTIONS	27. Identify the six principal views of an object.
	28. Demonstrate the theory of orthographic projection.
PICTORIAL DRAWINGS	29. Demonstrate the theories of pictorial drawings. - Isometric - Oblique - Perspective

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

TECHNICAL DRAWING

TOPICS	STUDENT OUTCOMES
	Students will
VIEWS	30. Demonstrate the principles of an auxiliary view. - Inclined surface - Skewed surface - Normal views
	31. Illustrate the types of breaks and symbols used in drawing sectional views.
	32. Demonstrate the types of sectional views. - Full - Half - Offset
DETAILED DRAWINGS	33. Illustrate detailed machine drawings. - Machine parts - Assembly drawings - Schematics Examples: electronics, pipes
CAREERS	34. Identify careers in the field of technical drawing.
	35. Express a knowledge of the technical drawing industry organizations.
	36. Demonstrate effective employability skills. Examples: résumés, job interviews

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

ENGINEERING GRAPHICS*

The purpose of this course is to provide students with a foundation of knowledge and technically oriented experiences in the study of Engineering Graphics.

The course content includes, but is not limited to, drafting skills, orthographic projection, technical illustration, architectural drawing, and computer-aided drafting. The course content is reinforced by laboratory activities and by the study of entrepreneurship, careers, safety, and leadership skills. Research and development are infused in the course through searching, experimenting, discovering, and testing.

*TECHNICAL DRAWING is a prerequisite for this course.

TOPICS	STUDENT OUTCOMES
	Students will
TECHNOLOGY	See pages 9-11, Outcomes 1-23.
DIMENSIONING AND TOLERANCING	24. Translate the technique and rules of dimensioning and tolerancing.
	25. Differentiate between simplified and conventional practices of dimensioning.
AUXILIARIES AND REVOLUTIONS	26. Explain the rules for drawing auxiliaries and revolutions.
	27. Demonstrate an understanding of primary and secondary types of auxiliaries.
	28. Demonstrate the principles of auxiliary and revolution drawings.
ARCHITECTURAL DRAWING	29. Interpret a set of architectural drawings.
	30. Demonstrate the ability to produce architectural drawings.

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

ENGINEERING GRAPHICS

TOPICS	STUDENT OUTCOMES
	Students will
TECHNICAL ILLUSTRATION	31. Demonstrate the processes of technical illustrations. Examples: shades and shadows, inking, air brushing, rendering
	32. Produce technical illustrations. Examples: maps, charts, graphs, topographic drawings
COMPUTER-AIDED DRAFTING (CAD)	33. Apply basic knowledge and skills of Computer-Aided Drafting (CAD).
	34. Apply CAD techniques to generate drawings. Examples: architectural drawings, machine drawings, schematics
	35. Collect or produce data on drafting technology through the operation of a computer.
MODELING AS A DRAFTING AID	36. Demonstrate the technical skills of producing a scale model.
FUNDAMENTALS OF DESIGN	37. Describe the basic principles and functions of good design.
	38. Outline steps and procedures followed in the industrial design of a product.

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

ENGINEERING GRAPHICS

TOPICS	STUDENT OUTCOMES
	Students will
RESEARCH AND EXPERIMENTATION	39. Illustrate drafting skills by designing and drawing a research project.
CAREERS	40. Identify careers in the field of engineering graphics.
	41. Express a knowledge of the engineering graphics industry organizations.
	42. Demonstrate effective employability skills. Examples: résumés, job interviews

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

CONSTRUCTION INDUSTRY

The purpose of this course is to provide students with a foundation of knowledge and technically oriented experiences in the study of the Construction Industry.

The course content includes, but is not limited to, the preparation of site; interpretation of blueprints, building codes, and permits; and the utilization of materials, tools, and building processes in construction. The course content is reinforced by laboratory activities and by the study of entrepreneurship, careers, safety, and leadership skills. Research and development are infused in the course through searching, experimenting, discovering, and testing.

TOPICS	STUDENT OUTCOMES
	Students will
TECHNOLOGY	See pages 9-11, Outcomes 1-23.
CONSTRUCTION SITE	24. Explain the steps and processes for identifying and acquiring sites for construction.
	25. Identify the tools, equipment, and technical skills required for construction site preparation.
DRAWINGS	26. Read blueprints.
	27. Describe building codes, zoning permits, and construction plans.
STRUCTURES	28. Identify types of structures. - Mass Example: dam - Wall Example: brick - Frame Examples: wood, steel - Air Example: dome covering
	29. Identify parts of structures. - Substructure - Superstructure

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

CONSTRUCTION INDUSTRY

TOPICS	STUDENT OUTCOMES
	Students will
STRUCTURES (continued)	30. Determine the types and costs of materials for the construction of substructures and superstructures.
	31. Utilize materials, tools, and building processes in the construction of structures. - Substructures - Superstructures
CAREERS	32. Identify careers in the construction industry.
	33. Express a knowledge of the construction industry organizations.
	34. Demonstrate effective employability skills. Examples: résumés, job interviews

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

POWER MECHANICS

The purpose of this course is to provide students with a foundation of knowledge and technically oriented experiences in the study of Power Mechanics.

The course content includes, but is not limited to, energy sources, external combustion engines, and internal combustion engines. The course content is reinforced by laboratory activities and by the study of enterpreneurship, careers, safety, and leadership skills. Research and development are infused in the course through searching, experimenting, discovering, and testing.

TOPICS	STUDENT OUTCOMES
	Students will
TECHNOLOGY	See pages 9-11, Outcomes 1-23.
SOURCES OF ENERGY	24. Discuss renewable and non-renewable sources of energy. Examples: fossil, electrical, wind, hydraulic, nuclear, solar
EXTERNAL COMBUSTION ENGINES	25. Differentiate between the external combustion engine and the internal combustion engine. 26. Analyze the structure and operating principles of the steam engine. 27. Interpret the effect of steam power on the Industrial Revolution. 28. Demonstrate a knowledge of heat theory as it applies to steam engines. 29. Explain the development, types, and uses of steam turbines. 30. Discuss how steam power plants are designed and operated.

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

POWER MECHANICS

TOPICS	STUDENT OUTCOMES
	Students will
INTERNAL COMBUSTION ENGINES	31. Differentiate among the types of internal combustion engines. - Compression versus spark ignition - Two-stroke versus four-stroke engines - Wankle engine
	32. Distinguish among the systems within the reciprocating engines.
	33. Distinguish among systems of the rotary combustion engines.
	34. Examine air stream reaction engines. - Jet engines - Turbine engines - Water reaction propelled craft
CAREERS	35. Identify careers in the power industry.
	36. Express a knowledge of the power industry organizations.
	37. Demonstrate effective employability skills. Examples: résumés, job interviews

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

POWER AND ENERGY

The purpose of this course is to provide students with a foundation of knowledge and technically oriented experiences in the study of Power and Energy.

The course content includes, but is not limited to, the survey and research of existing power and energy systems; evaluation of power systems; and transmission, control, and conversion of energy through mechanical, fluid, and electrical devices. The course content is reinforced by laboratory activities and by the study of entrepreneurship, careers, safety, and leadership skills. Research and development are infused in the course through searching, experimenting, discovering, and testing.

TOPICS	STUDENT OUTCOMES
	Students will
TECHNOLOGY	See pages 9-11, Outcomes 1-23.
POWER AND ENERGY	24. Discuss the principles of machines. 25. Discuss the transmission and control of power and energy. - Mechanical - Fluid - Electrical - Solar - Thermal - Nuclear 26. Define the use of power and energy in industry. Examples: pneumatic systems, hydraulic systems, mechanical systems, electrical systems
APPLICATIONS OF POWER AND ENERGY	27. Construct or use models that utilize power and energy systems.

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

POWER AND ENERGY

TOPICS	STUDENT OUTCOMES
	Students will
APPLICATIONS OF POWER AND ENERGY (continued)	28. Relate the principles of lasers and fiber optics to conventional power and energy sources.
ENVIRONMENTAL CONTROL SYSTEMS	29. Discuss ways in which the environment can be protected from domestic and commercial power and energy production and consumption.
	30. Discuss the use of power and energy in industry.
CAREERS	31. Identify careers in the field of power and energy.
	32. Express a knowledge of the power and energy industry organizations.
	33. Demonstrate effective employability skills. Examples: résumés, job interviews

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

ELECTRONICS TECHNOLOGY

The purpose of this course is to provide students with a foundation of knowledge and technically oriented experiences in the study of Electronics Technology.

The course content includes, but is not limited to, the study of electrical laws, solid-state electronic devices, power supplies and sources as well as the application of basic electronics circuits and systems. The course content is reinforced by laboratory activities and by the study of entrepreneurship, careers, safety, and leadership skills. Research and development are infused in the course through searching, experimenting, discovering, and testing.

TOPICS	STUDENT OUTCOMES
	Students will
TECHNOLOGY	See pages 9-11, Outcomes 1-23.
STRUCTURE OF MATTER RELATED TO ELECTRONICS	24. Describe the composition of elements, mixtures, and compounds according to electron theory.
	25. Explain the relationship among electrons, protons, and neutrons.
	26. Describe the classification and characteristics of materials as they apply to conductors, insulators, and semi-conductors.
USE OF OHM'S AND WATT'S LAW	27. Apply Ohm's Law to circuits.
	28. Apply Watt's Law to circuits.
	29. Identify types of resistors. - Rating - Use
	30. Identify electronics symbols.
BASIC CIRCUITS	31. Solve mathematical problems related to direct current and alternating current circuits.

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

ELECTRONICS TECHNOLOGY

TOPICS	STUDENT OUTCOMES
	Students will
BASIC CIRCUITS (continued)	32. Demonstrate proper operation of multimeters in D.C. and A.C. circuits.
	33. Demonstrate proper operations of power supplies in D.C. and A.C. circuits.
	34. Construct simple circuits using basic electronic components.
INDUCTORS AND TRANSFORMERS	35. Explain the theory and application of inductors and transformers.
	36. Demonstrate a knowledge of circuits using inductors and transformers.
CIRCUITS	37. Identify types of capacitors. - Rating - Use
	38. Explain integrated circuits. - Components - Materials
	39. Demonstrate a knowledge of electronic circuits that contain transistors and capacitors.
ELECTRONIC ASSEMBLY METHODS	40. Exhibit correct soldering techniques.
	41. Describe methods of making a printed circuit board.
CIRCUITS USING SEMICONDUCTORS	42. Describe the general theory and application of semiconductor devices.

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

ELECTRONICS TECHNOLOGY

TOPICS	STUDENT OUTCOMES
	Students will
CIRCUITS USING SEMICONDUCTORS (continued)	43. Explain the difference between N-type and P-type material.
	44. Demonstrate a knowledge of semiconductors' devices.
CAREERS	45. Identify careers in the field of Electronics Technology.
	46. Express a knowledge of the Electronics Technology industry organizations.
	47. Demonstrate effective employability skills. Examples: résumés, job interviews

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

METAL TECHNOLOGY

The purpose of this course is to provide students with a foundation of knowledge and technically oriented experiences in the study of Metal Technology.

The course content includes, but is not limited to, a study of the processes, uses, and technical skills of Metal Technology. The course content is reinforced by laboratory activities and by the study of entrepreneurship, careers, safety, and leadership skills. Research and development are infused in the course through searching, experimenting, discovering, and testing.

TOPICS	STUDENT OUTCOMES
	Students will
TECHNOLOGY	See pages 9-11, Outcomes 1-23.
FITTING AND ASSEMBLING	24. Demonstrate hand and machine processes for fastening metals.
METAL FABRICATION	25. Describe the tools that are used in metal fabrication.
	26. Demonstrate the processes used in soldering and brazing metals.
	27. Demonstrate the techniques used in the various types of welding.
SHAPING PROCESSES	28. Demonstrate a knowledge of hand and machine processes for shaping metals.
	29. Discuss the metal marking systems.
HOT METAL FORMING PROCESSES	30. Demonstrate hand and machine processes for forming metals.
	Examples: forging and bending, heat treatment of steel, melting, pouring, casting

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

METAL TECHNOLOGY

TOPICS	STUDENT OUTCOMES
	Students will
MACHINE TOOL OPERATIONS	31. Demonstrate machine tool operations. Examples: drilling, turning, milling, boring
QUALITY CONTROL	32. Demonstrate quality control through nondestructive testing and inspecting.
CAREERS	33. Identify careers in the field of Metal Technology. 34. Express a knowledge of Metal Technology industry organizations. 35. Demonstrate effective employability skills. Examples: résumés, job interviews

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

WOOD TECHNOLOGY

The purpose of this course is to provide students with a foundation of knowledge and technically oriented experiences in the study of Wood Technology.

The course content includes, but is not limited to, the study of the basic properties of woods and the tools and machines used in the procedures for the production of various wood products. Emphasis is on achieving technical design and designating the uses of specific woods. The course content is reinforced by laboratory activities and by the study of entrepreneurship, careers, safety, and leadership skills. Research and development are infused in the course through searching, experimenting, discovering, and testing.

TOPICS	STUDENT OUTCOMES
	Students will
TECHNOLOGY	See pages 9-11, Outcomes 1-23.
WOOD INDUSTRIES	24. Discuss the parts and functions of a tree.
	25. Discuss the lumbering process.
	26. Examine the products of the forestry industry.
	27. Grade woods based on their physical qualities.
HAND TOOLS	28. Classify hand tools according to their proper use within Wood Technology.
	Examples: sawing, shaping and carving, drilling, boring, clamping

INDUSTRIAL ARTS/TECHNOLOGY EDUCATION

WOOD TECHNOLOGY

TOPICS	STUDENT OUTCOMES
	Students will
POWER TOOLS AND MACHINES	29. Demonstrate safety procedures in the use of power tools and machines in Wood Technology. Examples: drill press, electric drill, band saw, radial arm saw, jointer, planer, table saw, lathe, shaper, sanding machines, router
JOINING STOCK	30. Demonstrate methods for joining stock. Examples: wood joints, adhesives, clamping techniques, lamination, plywood, veneers, fastening devices
FINISHING	31. Explain the steps used to prepare a wood surface for finishing. 32. Demonstrate the use of finishing materials in Wood Technology.
CAREERS	33. Identify careers in the field of Wood Technology. 34. Express a knowledge of Wood Technology industry organizations. 35. Demonstrate effective employability skills. Examples: résumés, job interviews

OPTIONAL COURSES

Research and Development

The purpose of this course is to provide students with a foundation of knowledge and technically oriented experiences in the study of Research and Development.

The course content includes, but is not limited to, the study of testing, experimenting, searching, and discovering by utilizing materials, processes, tools, and/or other curricular components in developing new or better applications of mechanisms, circuits, and technology. The course content is reinforced by laboratory activities and by the study of entrepreneurship, careers, safety, and leadership skills.

Telecommunications Technology

The purpose of this course is to provide students with a foundation of knowledge and technically oriented experiences in the study of Telecommunications Technology.

The course content includes, but is not limited to, the study of the construction and fabrication of simple communications systems as well as the experimentation with modern communications systems. Included in this experience is the interaction of computers in the communications process. The course content is reinforced by laboratory activities and by the study of entrepreneurship, careers, safety, and leadership skills.

VOCATIONAL STUDENT ORGANIZATIONS

Vocational Student Organizations (VSOs) provide a unique instructional method for attaining the student outcomes identified in each vocational program. The VSO activities are considered part of the instructional day as they are directly related to the competencies, goals, and objectives of the program.

Participation in any VSO provides students with various opportunities to:

Develop leadership skills.
Enhance vocational preparation.
Work together as a team.
Become productive citizens in a democracy.
Strengthen critical-thinking skills.
Facilitate and encourage personal development.
Develop human relations skills.
Gain recognition for accomplishments.
Develop decision-making skills.
Foster a respect for the dignity of work.
Develop skills for family and community living.

A Vocational Student Organization (VSO) is an integral part of each program area's curriculum. The following VSOs are approved by the Alabama Board of Education:

National FFA Organization (FFA)
Distributive Education Clubs of America (DECA)
Future Business Leaders of America (FBLA)
Health Occupations Students of America (HOSA)
Future Homemakers of America/Home Economics Related Occupations (FHA/HERO)
Technology Student Association (TSA)
Vocational Industrial Clubs of America (VICA)

All local VSOs are affiliated with the state and national associations and are supported by membership dues and fund-raising efforts. Any student currently or previously enrolled in an Industrial Arts/Technology course or program is eligible for membership in the vocational student organization associated with that program.